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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/788,629 | RAKESTRAW ET AL. | |
| | Examiner | Art Unit | |
| | ALEX NOGUEROLA | 1753 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *pre-amndt. of 02/27/2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *171-195* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *192-195* is/are allowed.

6)☒ Claim(s) *171-186* is/are rejected.

7)☒ Claim(s) *187-191* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 February 2004* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *6/14/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☒ Other: *IDs of 6/18/2004*.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 171, 179, and 180 are rejected under 35 U.S.C. 102(e) as being anticipated by Hencken et al. US 6,770,183 B1 ("Hencken").

Addressing claim 171, Hencken discloses an electrokinetic device comprising:

a solid substrate (105), wherein the solid substrate comprises a fluid path (106) formed in the solid substrate (Figure 1);

a first pumping conduit in the fluid path having a first end and a second end (the ends being defined by electrodes 115 in Figure 1), said first pumping conduit comprising a porous dielectric material (110 – col. 03:12-29);

a first electrode (left electrode 115), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figure 1);

a first conducting conduit having a first end and a second end (right conduit 106), wherein the first end of the first conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figure 1);

a second electrode (right electrode 115) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid; and

a cover (125) on the solid substrate which seals the fluid path (Figure 1).

Addressing claims 179 and 180, for the additional limitations of these claims see col. 03:12-21.

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 171-181 and 186 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takamura et al. "Low-Voltage Electroosmosis Pump and its Application to On-Chip Linear Stepping Pneumatic Pressure Source," MicroTotal analysis Systems 2001, 230-232 ("Takamura") in view of Hencken et al. US 6,770,183 B1 ("Hencken") and Pace US 4,908,112 ("Pace").

Addressing claim 171, Takamura discloses a first pumping conduit in a fluid path having a first end and a second end (e.g., the middle narrow gap section circled in Figure 3);

a first electrode (in Figure 3 the gel electrode above the circled middle narrow gap section), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figure 3);

a first conducting conduit having a first end and a second end (circled wide gap section in Figure 3), wherein the first end of the first conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figure 3);

a second electrode (in Figure 3 the gel electrode below the circled middle narrow gap section) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid (Figure 3).

Takamura does not mention providing a solid substrate comprising a fluid path formed therein for the embodiment of Figure 3. However, it would have been obvious to one with ordinary skill in the art at the time of the invention to provide a solid substrate comprising a fluid path formed therein for the embodiment of Figure 3 because the embodiments of Figure 3 is clearly an extension of the embodiment o Figure 1, which is made by dry-etching channels into a quartz chip to form an EOF (electroosmotic) pump (see the bottom of page 230). Also, as seen from the abstract the article concerns low-voltage EOF pumps microfabricated on quartz chips.

Takamura also does not mention having the pumping conduit comprise a porous dielectric material. However, it would have been obvious to one with ordinary skill in the art at the time of the invention from Figure 3 that the each pumping conduit comprises an array of very narrow parallel channels etched into the substrate because it shows very closely spaced parallel lines.

*Alternatively*, Hencken discloses an electrokinetic device comprising:

a solid substrate (105), wherein the solid substrate comprises a fluid path (106) formed in the solid substrate (Figure 1);

a first pumping conduit in the fluid path having a first end and a second end (the ends being defined by electrodes 115 in Figure 1), said first pumping conduit comprising a porous dielectric material (110 – col. 03:12-29);

a first electrode (left electrode 115), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figure 1);

a first conducting conduit having a first end and a second end (right conduit 106), wherein the first end of the first conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figure 1);

a second electrode (right electrode 115) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid; and

a cover (125) on the solid substrate which seals the fluid path (Figure 1).

It would have been obvious to one with ordinary skill in the art at the time of the invention to have the pumping conduit comprise a porous dielectric material, namely a parallel array of closely spaced, very narrow channels through a dielectric material as taught by Hencken in the invention of Takamura because as taught by Hencken the benefit of higher EOF pressure through providing a porous region can be obtained without the manufacturing problems of conventional methods of making a porous region in a microchannel, such as the hazard of very high pressures needed when packing a slurry of particles to form a bed or the difficulty of retaining the structural integrity of a porous plug that is to be fused to the wall of the microchannel (col. 01:14 – col. 03:08).

Takamura does not mention providing a cover on the solid substrate which seals the fluid path. As described above it would have been obvious to one with ordinary skill in the art at the time of the invention to make the electrokinetic device of Takamura by etching channels into a solid substrate namely because the article is about EOF pumps microfabricated on quartz chips. Hencken, which as described above meets all of the limitations of claim 171, and Pace, which discloses an EOF pumping system made on a solid substrate comprising a microchannel network (abstract), both provide a cover on the solid substrate which seals the fluid path (Figure 1 in Hencken and Figure 3 in Pace). It would have been obvious to one with ordinary skill in the art at the time of the invention to provide a cover on the solid substrate which seals the fluid path as taught by Hencken or Pace in the invention of Takamura because this will (i) provide additional surface for creating EOF, (ii) protect the fluid from airborne contaminants or particles, (iii) allow the electrodes to completely surround the formed conduit for maximal contact with the fluids therein (col. 06:56-60 in Pace), and (iv) allows the generation of very high pressures (it is not likely that the very high pressures achieved, of up to 10000 psi, by Hencken could be generated if the fluid path is exposed to atmospheric pressure.

Addressing claims 172-178, for the additional limitations of these claims see in Takamura Figure 3 and note the serial arrangement of three pairs of pumping conduit and conducting conduit.

Addressing claims 179 and 180, for the additional limitations of this claim note that as pointed out in the rejection of underlying claim 171 Takamura discloses that the article is about microfabricating low-voltage EOF pumps on quartz (silica) chips. Moreover, the substrate comprise an electrically insulating material otherwise the electrodes would short out.

Addressing claims 181, for the additional limitation of this claim note the sale bridges in Figure 3 of Takamura.

Addressing claim 186, Takamura discloses a first pumping conduit in a fluid path having a first end and a second end (e.g., the leftmost narrow gap section in Figure 3);

a first conducting conduit having a first end and a second end (leftmost wide gap section in Figure 3), wherein the first end of the first conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figure 3);

a second pumping conduit in a fluid path having a first end and a second end (e.g., the middle narrow gap section in Figure 3), the second pumping conduit is in electrical communication with the second end of the first conducting conduit at a second junction when the fluid path contains the transport fluid (Figure 3);

a second conducting conduit having a first end and a second end (leftmost wide gap section in Figure 3), wherein the first end of the second conducting conduit is in electrical communication with the second end of the second pumping conduit at a second junction at a third junction when the fluid path contains the transport fluid (Figure 3);

a first electrode (in Figure 3 the leftmost gel electrode in the top row of electrodes), wherein the first electrode is in electrical communication with the first end of the first pumping conduit, with the second junction and with the second end of the second conducting conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figure 3);

a second electrode (in Figure 3 the leftmost gel electrode in the bottom row of electrodes) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid (Figure 3).

Takamura does not mention providing a solid substrate comprising the fluid path formed therein for the embodiment of Figure 3. However, it would have been obvious to one with ordinary skill in the art at the time of the invention to provide a solid substrate

comprising a fluid path formed therein for the embodiment of Figure 3 because the embodiments of Figure 3 is clearly an extension of the embodiment o Figure 1, which is made by dry-etching channels into a quartz chip to form an EOF (electroosmotic) pump (see the bottom of page 230). Also, as seen from the abstract the article concerns low-voltage EOF pumps microfabricated on quartz chips.

Takamura also does not mention having the pumping conduits comprise a porous dielectric material. However, it would have been obvious to one with ordinary skill in the art at the time of the invention from Figure 3 that the each pumping conduit comprises an array of very narrow parallel channels etched into the substrate because it shows very closely spaced parallel lines.

*Alternatively*, Hencken discloses an electrokinetic device comprising:

a solid substrate (105), wherein the solid substrate comprises a fluid path (106) formed in the solid substrate (Figure 1);

a first pumping conduit in the fluid path having a first end and a second end (the ends being defined by electrodes 115 in Figure 1), said first pumping conduit comprising a porous dielectric material (110 – col. 03:12-29);

a first electrode (left electrode 115), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figure 1);

a first conducting conduit having a first end and a second end (right conduit 106), wherein the first end of the first conducting conduit is in electrical communication with

the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figure 1);

a second electrode (right electrode 115) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid; and

a cover (125) on the solid substrate which seals the fluid path (Figure 1).

It would have been obvious to one with ordinary skill in the art at the time of the invention to have the pumping conduits comprise a porous dielectric material, namely a parallel array of closely spaced, very narrow channels through a dielectric material as taught by Hencken in the invention of Takamura because as taught by Hencken the benefit of higher EOF pressure through providing a porous region can be obtained without the manufacturing problems of conventional methods of making a porous region in a microchannel, such as the hazard of very high pressures needed when packing a slurry of particles to form a bed or the difficulty of retaining the structural integrity of a porous plug that is to be fused to the wall of the microchannel (col. 01:14 – col. 03:08).

Takamura does not mention providing a cover on the solid substrate which seals the fluid path. As described above it would have been obvious to one with ordinary skill in the art at the time of the invention to make the electrokinetic device of Takamura by etching channels into a solid substrate namely because the article is about EOF pumps microfabricated on quartz chips. Hencken, which as described above meets all of the limitations of claim 171, and Pace, which discloses an EOF pumping system made on a

solid substrate comprising a microchannel network (abstract), both provide a cover on the solid substrate which seals the fluid path (Figure 1 in Hencken and Figure 3 in Pace). It would have been obvious to one with ordinary skill in the art at the time of the invention to provide a cover on the solid substrate which seals the fluid path as taught by Hencken or Pace in the invention of Takamura because this will (i) provide additional surface for creating EOF, (ii) protect the fluid from airborne contaminants or particles, (iii) allow the electrodes to completely surround the formed conduit for maximal contact with the fluids therein (col. 06:56-60 in Pace), and (iv) allows the generation of very high pressures (it is not likely that the very high pressures achieved, of up to 10000 psi, by Hencken could be generated if the fluid path is exposed to atmospheric pressure.

7. Claims 182 and 183 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takamura et al. "Low-Voltage Electroosmosis Pump and its Application to On-Chip Linear Stepping Pneumatic Pressure Source," MicroTotal analysis Systems 2001, 230-232 ("Takamura") in view of Hencken et al. US 6,770,183 B1 ("Hencken") and Pace US 4,908,112 ("Pace") as applied to claims 171-181 above, and further in view of West et al. US 6,159,353 ("West") and Rocklin et al. US 5,296,115 ("Rocklin").

It should be first noted that the Examiner assumes that claim 182 is intended to depend from claim 181. For the additional limitations of claims 182 and 183 note that although a first electrolyte –filled fluid reservoir is not shown in Figure 3 of Takamura a salt bridge is shown therein. It would have been obvious to one with ordinary skill in the art at the time of the invention to also provide an electrolyte-filled fluid reservoir because Figure 1 of Takamura shows in a detailed view of a pumping conduit an electrolyte-filled fluid reservoir, wherein an electrode is in electrical communication with a bridge through the electrolyte fluid reservoir. Moreover, as shown be West and Rocklin by proving an electrode for generating an electrokinetic force in an electrolyte-filled fluid reservoir, wherein the electrode is in electrical communication with a bridge through the electrolyte fluid reservoir will allow the electrokinetic current flow to isolated from other current flows through the fluid. See in Rocklin the abstract; Figure 1; and col. 02:10-32 and in West Figures 9 and 9A and col. 07:63 – col. 08:04.

8. Claim 184 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takamura et al. "Low-Voltage Electroosmosis Pump and its Application to On-Chip Linear Stepping Pneumatic Pressure Source," MicroTotal analysis Systems 2001, 230-232 ("Takamura") in view of Hencken et al. US 6,770,183 B1 ("Hencken"), Pace US 4,908,112 ("Pace"), and West et al. US 6,159, 353 ("West") .

Addressing claim 184, Takamura discloses a plurality of pumping conduits in a fluid path, said fluid path comprising a fluid entrance and a fluid exit, each pumping conduit having a first end and a second end (e.g., the middle narrow gap section circled in Figure 3), comprising a last pumping conduit in fluid communication with the fluid exit (Figure 3);

a first electrode (in Figure 3 the gel electrode above the circled middle narrow gap section), wherein the first electrode is in electrical communication with the first end of the each of the pumping conduits when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figure 3);

a plurality of conducting conduits in the fluid path, each having a first end and a second end (circled wide gap section in Figure 3), wherein the first end of each conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid, comprising a last conducting conduit in fluid communication with the second end of the lat pumping conduit (Figure 3);

a second electrode (in Figure 3 the gel electrode below the circled middle narrow gap section) in electrical communication with the each second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid (Figure 3).

Takamura does not mention providing a solid substrate comprising a fluid path formed therein for the embodiment of Figure 3. However, it would have been obvious to

one with ordinary skill in the art at the time of the invention to provide a solid substrate comprising a fluid path formed therein for the embodiment of Figure 3 because the embodiments of Figure 3 is clearly an extension of the embodiment o Figure 1, which is made by dry-etching channels into a quartz chip to form an EOF (electroosmotic) pump (see the bottom of page 230). Also, as seen from the abstract the article concerns low-voltage EOF pumps microfabricated on quartz chips.

Takamura also does not mention having the pumping conduit comprise a porous dielectric material. However, it would have been obvious to one with ordinary skill in the art at the time of the invention form Figure 3 that the pumping conduit, which is, for example, the circled middle narrow gap section, comprises an array of very narrow parallel channels etched into the substrate.

*Alternatively*, Hencken discloses an electrokinetic device comprising:

a solid substrate (105), wherein the solid substrate comprises a fluid path (106) formed in the solid substrate (Figure 1);

a first pumping conduit in the fluid path having a first end and a second end (the ends being defined by electrodes 115 in Figure 1), said first pumping conduit comprising a porous dielectric material (110 – col. 03:12-29);

a first electrode (left electrode 115), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figure 1);

a first conducting conduit having a first end and a second end (right conduit 106), wherein the first end of the first conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figure 1);

a second electrode (right electrode 115) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid; and

a cover (125) on the solid substrate which seals the fluid path (Figure 1).

It would have been obvious to one with ordinary skill in the art at the time of the invention to have the pumping conduit comprise a porous dielectric material, namely a parallel array of closely spaced, very narrow channels through a dielectric material as taught by Hencken in the invention of Takamura because as taught by Hencken the benefit of higher EOF pressure through providing a porous region can be obtained without the manufacturing problems of conventional methods of making a porous region in a microchannel, such as the hazard of very high pressures needed when packing a slurry of particles to form a bed or the difficulty of retaining the structural integrity of a porous plug that is to be fused to the wall of the microchannel (col. 01:14 – col. 03:08).

Takamura does not mention providing a cover on the solid substrate which seals the fluid path. As described above it would have been obvious to one with ordinary skill in the art at the time of the invention to make the electrokinetic device of Takamura by etching channels into a solid substrate namely because the article is about EOF pumps

microfabricated on quartz chips. Hencken, which as described above meets all of the limitations of claim 171, and Pace, which discloses an EOF pumping system made on a solid substrate comprising a microchannel network (abstract), both provide a cover on the solid substrate which seals the fluid path (Figure 1 in Hencken and Figure 3 in Pace). It would have been obvious to one with ordinary skill in the art at the time of the invention to provide a cover on the solid substrate which seals the fluid path as taught by Hencken or Pace in the invention of Takamura because this will (i) provide additional surface for creating EOF, (ii) protect the fluid from airborne contaminants or particles, (iii) allow the electrodes to completely surround the formed conduit for maximal contact with the fluids therein (col. 06:56-60 in Pace), and (iv) allows the generation of very high pressures (it is not likely that the very high pressures achieved, of up to 10000 psi, by Hencken could be generated if the fluid path is exposed to atmospheric pressure.

Takamura also does not mention providing a third electrode in electrical communication with the second end of the last of the conducting conduits when the fluid path contains the transport fluid.

West discloses an electrokinetic device in which a first electrode for providing an electrokinetic force is provided at one end of conduit in a solid substrate, a second electrode (36) for providing an electrokinetic force when used with the first electrode is provided at the other end of the conduit (col. 09:29-37), and a third electrode (any of the detection electrodes, e.g., 12) at the end of the conduit, after the second electrode (off-column detection embodiments – Figures 9 and 10 and col. 07:55 – col. 08:26.

It would have been obvious to one with ordinary skill in the art at the time of the invention to provide a third electrode after the second electrode (that is, off-column detection electrodes) because then the fluid components can be detected and their flow monitored without interference from the electroosomosis current from the pairs of first and second electrodes (West col. 07:55 – col. 08:26).

9. Claims 171-180 and 186 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohkawa US 6,619,925 B2 ("Ohkawa") in view of Pace US 4,908,112 ("Pace").

Addressing claim 171, Ohkawa discloses a solid substrate (elongated tube – Figure 2, or connected tubing sections - Figure 4), wherein the solid substrate comprises a fluid path formed in the solid substrate (Figures 2 and 4);

a first pumping conduit in a fluid path having a first end and a second end (30 in Figure 2 or Figure 4), the first pumping conduit comprising a porous dielectric material ("thread" 24, which is bundle of fibers 26);

a first electrode (16 or 46), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figures 2 and 4);

a first conducting conduit having a first end and a second end (32 in Figure 2 or Figure 4), wherein the first end of the first conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figures 2 and 4);

a second electrode (18 or 46) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid (Figures 2 and 4).

Ohkawa does not provide a cover on the solid substrate which seals the fluid path. Such a cover is not needed because the solid substrate is already sealed since it is a tube.

Pace discloses an EOF pumping system made on a solid substrate comprising a microchannel network (abstract) and a cover on the solid substrate which seals the fluid path (Figure 3 in Pace). It would have been obvious to one with ordinary skill in the art at the time of the invention to manufacture the electrokinetic device into a microfluidic chip format as taught by Pace in the invention of Ohkawa because then a network of interconnected microchannels can be formed in a compact, easily handled device, without the need to provide unions or joints for connecting the micro channels. Moreover, in a microfluidic chip form as taught by Pace, "All analytical components needed for the separation [transport for EOF mode] and detection of the separated [transported] components are inclusive within the device and comprise sensing electrodes, drive electrodes, light guides, photodiodes and compartments for sample and reagent introduction" (col. 03:26-38 in Pace).

Addressing claims 172-178, for the additional limitations of these claims see in Ohkawa Figure 2.

Addressing claims 179 and 180, for the additional limitations of these claims see in Pace col. 05:35-48.

Addressing claim 186, Ohkawa discloses a solid substrate (elongated tube – Figure 2, or connected tubing sections - Figure 4), wherein the solid substrate comprises a fluid path formed in the solid substrate (Figures 2 and 4);

a first pumping conduit in a fluid path having a first end and a second end (30 in Figure 2 or Figure 4), the first pumping conduit comprising a porous dielectric material ("thread" 24, which is bundle of fibers 26);

a first conducting conduit having a first end and a second end (32 in Figure 2 or Figure 4), wherein the first end of the first conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figures 2 and 4);

a second pumping conduit having a first end and a second end (30' in Figure 2 or second "30" Figure 4), the second pumping conduit comprising a porous dielectric material ("thread" 24, which is bundle of fibers 26);

a second conducting conduit having a first end and a second end (to the right of section 30' in Figure 2 or section 23 after second pumping conduit 30 in Figure 4), wherein the first end of the second conducting conduit is in electrical communication with the second end of the second pumping conduit at a third junction when the fluid path contains the transport fluid (Figures 2 and 4);

a first electrode (16 or 46), wherein the first electrode is in electrical communication with the first end of the first pumping conduit, with the second junction and with the second conducting conduit when the fluid path contains a transport fluid (Figures 2 and 4); and

a second electrode (18 or 46) in electrical communication with the first junction and with the third junction when the fluid path contains the transport fluid (Figures 2 and 4).

Ohkawa does not provide a cover on the solid substrate which seals the fluid path. Such a cover is not needed because the solid substrate is already sealed since it is a tube.

Pace discloses an EOF pumping system made on a solid substrate comprising a microchannel network (abstract) and a cover on the solid substrate which seals the fluid path (Figure 3 in Pace). It would have been obvious to one with ordinary skill in the art at the time of the invention to manufacture the electrokinetic device into a microfluidic chip format as taught by Pace in the invention of Ohkawa because then a network of interconnected microchannels can be formed in a compact, easily handled device, without the need to provide unions or joints for connecting the micro channels.

Moreover, in a microfluidic chip form as taught by Pace, "All analytical components needed for the separation [transport for EOF mode] and detection of the separated [transported] components are inclusive within the device and comprise sensing electrodes, drive electrodes, light guides, photodiodes and compartments for sample and reagent introduction" (col. 03:26-38 in Pace).

10. Claim 172 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hencken et al. US 6,770,183 B1 ("Hencken") in view of Ohkawa US 6,619,925 B2 ("Ohkawa").

Addressing claim 172, Hencken discloses an electrokinetic device comprising:

a solid substrate (105), wherein the solid substrate comprises a fluid path (106) formed in the solid substrate (Figure 1);

a first pumping conduit in the fluid path having a first end and a second end (the ends being defined by electrodes 115 in Figure 1), said first pumping conduit comprising a porous dielectric material (110 – col. 03:12-29);

a first electrode (left electrode 115), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figure 1);

a first conducting conduit having a first end and a second end (right conduit 106), wherein the first end of the first conducting conduit is in electrical communication with

the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figure 1);

a second electrode (right electrode 115) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid; and

a cover (125) on the solid substrate which seals the fluid path (Figure 1).

Hencken does not mention further providing a third electrode, wherein the third electrode is in electrical communication with the second end of the first conducting conduit when the fluid path contains the transport fluid.

Ohkawa discloses a solid substrate (elongated tube – Figure 2, or connected tubing sections - Figure 4), wherein the solid substrate comprises a fluid path formed in the solid substrate (Figures 2 and 4);

a first pumping conduit in a fluid path having a first end and a second end (30 in Figure 2 or Figure 4), the first pumping conduit comprising a porous dielectric material ("thread" 24, which is bundle of fibers 26);

a first electrode (16 or 46), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figures 2 and 4);

a first conducting conduit having a first end and a second end (32 in Figure 2 or Figure 4), wherein the first end of the first conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figures 2 and 4);

a second electrode (18 or 46) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid (Figures 2 and 4).

Ohkawa further discloses providing a third electrode, wherein the third electrode is in electrical communication with the second end of the first conducting conduit when the fluid path contains the transport fluid (16' - Figure 2). It would have been obvious to one with ordinary skill in the art at the time of the invention to provide a third electrode as taught by Ohkawa in the invention of Hencken because as taught by Ohkawa the pumping pressure head can be increased without requiring additional voltage (col. 05:06-12).

Addressing claim 173, Hencken discloses an electrokinetic device comprising:

a solid substrate (105), wherein the solid substrate comprises a fluid path (106) formed in the solid substrate (Figure 1);

a first pumping conduit in the fluid path having a first end and a second end (the ends being defined by electrodes 115 in Figure 1), said first pumping conduit comprising a porous dielectric material (110 – col. 03:12-29);

a first electrode (left electrode 115), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figure 1);

a first conducting conduit having a first end and a second end (right conduit 106), wherein the first end of the first conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figure 1);

a second electrode (right electrode 115) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid; and

a cover (125) on the solid substrate which seals the fluid path (Figure 1).

Hencken does not mention further providing a third electrode, wherein the third electrode is in electrical communication with the second end of the first conducting conduit when the fluid path contains the transport fluid.

Ohkawa discloses a solid substrate (elongated tube – Figure 2, or connected tubing sections - Figure 4), wherein the solid substrate comprises a fluid path formed in the solid substrate (Figures 2 and 4);

a first pumping conduit in a fluid path having a first end and a second end (30 in Figure 2 or Figure 4), the first pumping conduit comprising a porous dielectric material ("thread" 24, which is bundle of fibers 26);

a first electrode (16 or 46), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figures 2 and 4);

a first conducting conduit having a first end and a second end (32 in Figure 2 or Figure 4), wherein the first end of the first conducting conduit is in electrical

communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figures 2 and 4);

a second electrode (18 or 46) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid (Figures 2 and 4).

Ohkawa further discloses having the second end of the first conducting conduit in electrical communication with the first electrode when the fluid path contains the transport fluid (Figure 2). It would have been obvious to one with ordinary skill in the art at the time of the invention to arrange the second end as taught by Ohkawa in the invention of Hencken because as taught by Ohkawa the pumping pressure head can be increased without requiring additional voltage (col. 05:06-12).

Addressing claim 174, Hencken discloses an electrokinetic device comprising:

a solid substrate (105), wherein the solid substrate comprises a fluid path (106) formed in the solid substrate (Figure 1);

a first pumping conduit in the fluid path having a first end and a second end (the ends being defined by electrodes 115 in Figure 1), said first pumping conduit comprising a porous dielectric material (110 – col. 03:12-29);

a first electrode (left electrode 115), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figure 1);

a first conducting conduit having a first end and a second end (right conduit 106), wherein the first end of the first conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figure 1);

a second electrode (right electrode 115) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid; and

a cover (125) on the solid substrate which seals the fluid path (Figure 1).

Hencken does not mention further providing a third electrode, wherein the third electrode is in electrical communication with the second end of the first conducting conduit when the fluid path contains the transport fluid.

Ohkawa discloses a solid substrate (elongated tube – Figure 2, or connected tubing sections - Figure 4), wherein the solid substrate comprises a fluid path formed in the solid substrate (Figures 2 and 4);

a first pumping conduit in a fluid path having a first end and a second end (30 in Figure 2 or Figure 4), the first pumping conduit comprising a porous dielectric material ("thread" 24, which is bundle of fibers 26);

a first electrode (16 or 46), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figures 2 and 4);

a first conducting conduit having a first end and a second end (32 in Figure 2 or Figure 4), wherein the first end of the first conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figures 2 and 4);

a second electrode (18 or 46) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid (Figures 2 and 4).

Ohkawa further discloses providing a second pumping conduit as claimed (Figure 2). It would have been obvious to one with ordinary skill in the art at the time of the invention to provide a second pumping conduit as taught by Ohkawa in the invention of Hencken because as taught by Ohkawa the pumping pressure head can be increased without requiring additional voltage (col. 05:06-12).

Addressing claim 175, Hencken discloses an electrokinetic device comprising:

a solid substrate (105), wherein the solid substrate comprises a fluid path (106) formed in the solid substrate (Figure 1);

a first pumping conduit in the fluid path having a first end and a second end (the ends being defined by electrodes 115 in Figure 1), said first pumping conduit comprising a porous dielectric material (110 – col. 03:12-29);

a first electrode (left electrode 115), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figure 1);

a first conducting conduit having a first end and a second end (right conduit 106), wherein the first end of the first conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figure 1);

a second electrode (right electrode 115) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid; and

a cover (125) on the solid substrate which seals the fluid path (Figure 1).

Hencken does not mention further providing a third electrode, wherein the third electrode is in electrical communication with the second end of the first conducting conduit when the fluid path contains the transport fluid.

Ohkawa discloses a solid substrate (elongated tube – Figure 2, or connected tubing sections - Figure 4), wherein the solid substrate comprises a fluid path formed in the solid substrate (Figures 2 and 4);

a first pumping conduit in a fluid path having a first end and a second end (30 in Figure 2 or Figure 4), the first pumping conduit comprising a porous dielectric material ("thread" 24, which is bundle of fibers 26);

a first electrode (16 or 46), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figures 2 and 4);

a first conducting conduit having a first end and a second end (32 in Figure 2 or Figure 4), wherein the first end of the first conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figures 2 and 4);

a second electrode (18 or 46) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid (Figures 2 and 4).

Ohkawa further discloses providing a second conducting conduit as claimed (Figure 2). It would have been obvious to one with ordinary skill in the art at the time of the invention to provide a second conducting conduit as taught by Ohkawa in the invention of Hencken because as taught by Ohkawa the pumping pressure head can be increased without requiring additional voltage (col. 05:06-12).

Addressing claim 176-178, Hencken discloses an electrokinetic device comprising:

a solid substrate (105), wherein the solid substrate comprises a fluid path (106) formed in the solid substrate (Figure 1);

a first pumping conduit in the fluid path having a first end and a second end (the ends being defined by electrodes 115 in Figure 1), said first pumping conduit comprising a porous dielectric material (110 – col. 03:12-29);

a first electrode (left electrode 115), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figure 1);

a first conducting conduit having a first end and a second end (right conduit 106), wherein the first end of the first conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figure 1);

a second electrode (right electrode 115) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid; and

a cover (125) on the solid substrate which seals the fluid path (Figure 1).

Hencken does not mention further providing a third electrode, wherein the third electrode is in electrical communication with the second end of the first conducting conduit when the fluid path contains the transport fluid.

Ohkawa discloses a solid substrate (elongated tube – Figure 2, or connected tubing sections - Figure 4), wherein the solid substrate comprises a fluid path formed in the solid substrate (Figures 2 and 4);

a first pumping conduit in a fluid path having a first end and a second end (30 in Figure 2 or Figure 4), the first pumping conduit comprising a porous dielectric material ("thread" 24, which is bundle of fibers 26);

a first electrode (16 or 46), wherein the first electrode is in electrical communication with the first end of the first pumping conduit when the fluid path contains a transport fluid in which electroosmotic flow can be induced (Figures 2 and 4);

a first conducting conduit having a first end and a second end (32 in Figure 2 or Figure 4), wherein the first end of the first conducting conduit is in electrical communication with the second end of the first pumping conduit at a first junction when the fluid path contains the transport fluid (Figures 2 and 4);

a second electrode (18 or 46) in electrical communication with the second end of the first pumping conduit and with the first end of the first conducting conduit at the first junction when the fluid path contains the transport fluid (Figures 2 and 4).

Ohkawa further discloses providing feat4us as set forth in Applicant's claims 176-178 (Figure 2). It would have been obvious to one with ordinary skill in the art at the time of the invention to provide these additional features as taught by Ohkawa in the invention of Hencken because as taught by Ohkawa the pumping pressure head can be increased without requiring additional voltage (col. 05:06-12).

**Double Patenting**

11. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

12. Claims 171, 185, and 186 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 35 of U.S. Patent No. 6,719,535 B2 in view of in view of Hencken et al. US 6,770,183 B1 ("Hencken") and Pace US 4,908,112 ("Pace").

Claim 35 of U.S. Patent No. 6,719,535 B2 does not mention either providing a solid substrate comprising a fluid path formed therein or a cover on the solid substrate which seals the fluid path.

Pace discloses an electrokinetic device (EOF pumping system) made on a solid substrate comprising a microchannel network (abstract) and a cover on the solid substrate which seals the fluid path (Figure 3 in Pace). It would have been obvious to one with ordinary skill in the art at the time of the invention to manufacture the electrokinetic device into a microfluidic chip format as taught by Pace in the invention of Hencken, so providing a solid substrate comprising a fluid path formed therein or a cover on the solid substrate which seals the fluid path, because then a network of interconnected microchannels can be formed in a compact, easily handled device, without the need to provide unions or joints for connecting the microchannels. Moreover, in a microfluidic chip form as taught by Pace, "All analytical components needed for the separation [transport for EOF mode] and detection of the separated [transported] components are inclusive within the device and comprise sensing electrodes, drive electrodes, light guides, photodiodes and compartments for sample and reagent introduction" (col. 03:26-38 in Pace).

13. Claim 172 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 35 of U.S. Patent No. 6,719,535 B2 in view of Hencken et al. US 6,770,183 B1 ("Hencken") and Pace US 4,908,112 ("Pace"). Claim 171, from which claim 172 depends, has been addressed above. The additional limitation of claim 172 is provided by claim 35.

14. Claim 173 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 35 of U.S. Patent No. 6,719,535 B2 in view of Hencken et al. US 6,770,183 B1 ("Hencken") and Pace US 4,908,112 ("Pace"). Claim 171, from which claim 173 depends, has been addressed above. The additional limitation of claim 173 is implied by the fourth paragraph of claim 35.

15. Claim 174 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 35 of U.S. Patent No. 6,719,535 B2 in view of Hencken et al. US 6,770,183 B1 ("Hencken") and Pace US 4,908,112 ("Pace"). Claim 173, from which claim 174 depends, has been addressed above. The additional limitation of claim 174 is provided by claim 35.

16. Claim 175 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 35 of U.S. Patent No. 6,719,535 B2 in view of Hencken et al. US 6,770,183 B1 ("Hencken") and Pace US 4,908,112 ("Pace"). Claim 174, from which claim 175 depends, has been addressed above. The additional limitation of claim 175 is provided by claim 35.

17. Claim 176 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 35 of U.S. Patent No. 6,719,535 B2 in view of Hencken et al. US 6,770,183 B1 ("Hencken") and Pace US 4,908,112 ("Pace"). Claim 175, from which claim 176 depends, has been addressed above. The additional limitation of claim 176 is provided by claim 35.

18. Claim 177 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the combination of claims 32 and 35 of U.S. Patent No. 6,719,535 B2 in view of Hencken et al. US 6,770,183 B1 ("Hencken") and Pace US 4,908,112 ("Pace"). Claim 176, from which claim 177 depends, has been addressed above. The additional limitation of claim 177 is provided by closely related method claim 32 of U.S. Patent No. 6,719,535 B2.

19. Claim 178 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the combination of claims 34 and 35 of U.S. Patent No. 6,719,535 B2 in view of Hencken et al. US 6,770,183 B1 ("Hencken") and Pace US 4,908,112 ("Pace"). Claim 171, from which claim 178 depends, has been

addressed above. The additional limitation of claim 178 is provided by closely related method claim 34 of U.S. Patent No. 6,719,535 B2.

20. Claim 179 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 34 of U.S. Patent No. 6,719,535 B2 in view of Hencken et al. US 6,770,183 B1 ("Hencken") and Pace US 4,908,112 ("Pace"). Claim 171, from which claim 179 depends, has been addressed above. For the additional limitation of claim 179 see in Hencken col. 03:12-21 and in Pace col. 05:35-45.

21. Claim 180 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 34 of U.S. Patent No. 6,719,535 B2 in view of Hencken et al. US 6,770,183 B1 ("Hencken") and Pace US 4,908,112 ("Pace"). Claim 171, from which claim 180 depends, has been addressed above. For the additional limitation of claim 180 see in Hencken col. 03:12-21 and in Pace col. 05:35-45.

### *Claim Rejections - 35 USC § 112*

22. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

23. Claim 182 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 182 depends from itself.

### *Allowable Subject Matter*

24. Claims 187-191 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

25. Claims 192-195 are allowed.

26. The following is a statement of reasons for the indication of allowable subject matter:

a) Claims 187 and 191- each combination of limitations requires that " ... the porous dielectric material of the first pumping conduit [or for claim 191, " at least one of the pumping conduits" ] comprises a non-polar polymeric surface with an ionic material adsorbed thereon, the ionic material having a hydrophobic end and a charged end, wherein the hydrophobic end of the ionic material is adsorbed onto the non-polar polymeric surface, the charged end of the ionic material thereby providing a charged site on the non-polar polymeric surface."

The claims of US 6,719,535 B2 do not specify what the porous dielectric material may be.

From the abstract of Takamura it may be inferred that the porous dielectric material in the embodiment of Figure 3 comprises closely spaced, parallel very narrow channels through a dielectric material. No mention made of an ionic material being adsorbed thereon. Also, the disclosed material is apparently made from quartz and so does not comprise a non-polar polymeric surface.

In Hencken the porous dielectric material comprises closely spaced, parallel very narrow channels through a dielectric material. There is no mention of having ionic material adsorbed on a surface of the pumping conduit. Also, the suggested materials for the dielectric material are borosilicate glass, fused silicate, or Zerodur™ , which is a glass ceramic, none of which is a non-polar polymeric material. See col. 03:12-21.

In Ohkawa the porous dielectric material is a bundle of fibers made of silica "or of some other active material well known in the pertinent art, which, when in contact with an aqueous solution, will develop a charge in the aqueous solution." See col. 04:45-51.

b) Claims 188-190 depend from allowable claim 187.

c) Claim 192 – the combination of limitations requires the porous member to comprise a non-polar polymeric surface with an ionic material adsorbed thereon, the ionic material having a hydrophobic end and a charged end, wherein the hydrophobic end of the ionic material is adsorbed onto the non-polar polymeric surface, the charged end of the ionic material thereby providing a charged site on the non-polar polymeric surface.

In Ye et al. ("Capillary electrochromatography with a silica column with a dynamically modified cationic surfactant," Journal of Chromatography A, 855 (1999) 137-145) the porous member comprises *bare silica* with an ionic material adsorbed thereon. See the abstract.

In Chaiyasut et al. ("Estimation of the dissociation constants for functional groups on modified and unmodified gel supports from the relationship between electroosmotic flow velocity and pH," Electrophoresis 2001, 22, 1267-1272) the porous member comprises *silica* gel with an ionic material adsorbed thereon. See the abstract and **2.2 Cartridge packing**.

Schoeniger et al. US 6,960,285 B2 discloses that the porous material " ... can include small particles: high surface area structures, fabricated within the microchannel, and porous materials, such as porous organic polymer materials." See the abstract; Figure 1; and col. 04:06-18.

Paul et al. US 6,572,749 states "By using pure organic liquids as the electrolyte in conjunction with conventional dielectric materials, such as microporous silica beads or microporous methacrylate-based polymer beads to construct an EKP it has been found that the result is a substantial increase in the effective zeta potential and substantial decease in ohmic current." See col. 06:39-44.

The claims of US 6,719,535 B2 do not specify what the porous dielectric material may be.

From the abstract of Takamura it may be inferred that the porous dielectric material in the embodiment of Figure 3 comprises closely spaced, parallel very narrow channels through a dielectric material. No mention made of an ionic material being adsorbed thereon. Also, the disclosed material is apparently made from quartz and so does not comprise a non-polar polymeric surface.

In Hencken the porous dielectric material comprises closely spaced, parallel very narrow channels through a dielectric material. There is no mention of having ionic material adsorbed on a surface of the pumping conduit. Also, the suggested materials for the dielectric material are borosilicate glass, fused silicate, or Zerodur™ , which is a glass ceramic, none of which is a non-polar polymeric material. See col. 03:12-21.

In Ohkawa the porous dielectric material is a bundle of fibers made of silica "or of some other active material well known in the pertinent art, which, when in contact with an aqueous solution, will develop a charge in the aqueous solution." See col. 04:45-51.

d) Claims 193-195 depend from allowable claim 192.

27. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEX NOGUEROLA whose telephone number is (571) 272-1343. The examiner can normally be reached on M-F 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NAM NGUYEN can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alex Noguerola

Alex Noguerola
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AU 1753
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